

The Facts & Myths About “Shorted” Casings

Presented to

TEG 292X [35,05]

Direct Assessment Methodology Application

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by

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**There Ain't No Such Thing
As a Water Short!!!**

A direct metallic contact:

Pipeline Steel to Casing Steel

Or

Test Lead Wire to Casing Steel

IS A SHORT

If there's water in a casing annulus,
it may cause a potential shift on the casing, but

IT IS NOT A SHORT

Office of Pipeline Safety

Code of Federal Regulations

§192.467 External corrosion control:
Electrical isolation.

(c) Except for unprotected copper inserted in ferrous pipe, each pipeline must be electrically isolated from metallic casings that are a part of the underground system. However, if isolation is not achieved because it is impractical, other measures must be taken to minimize corrosion of the pipeline inside the casing.

ASSUMPTIONS

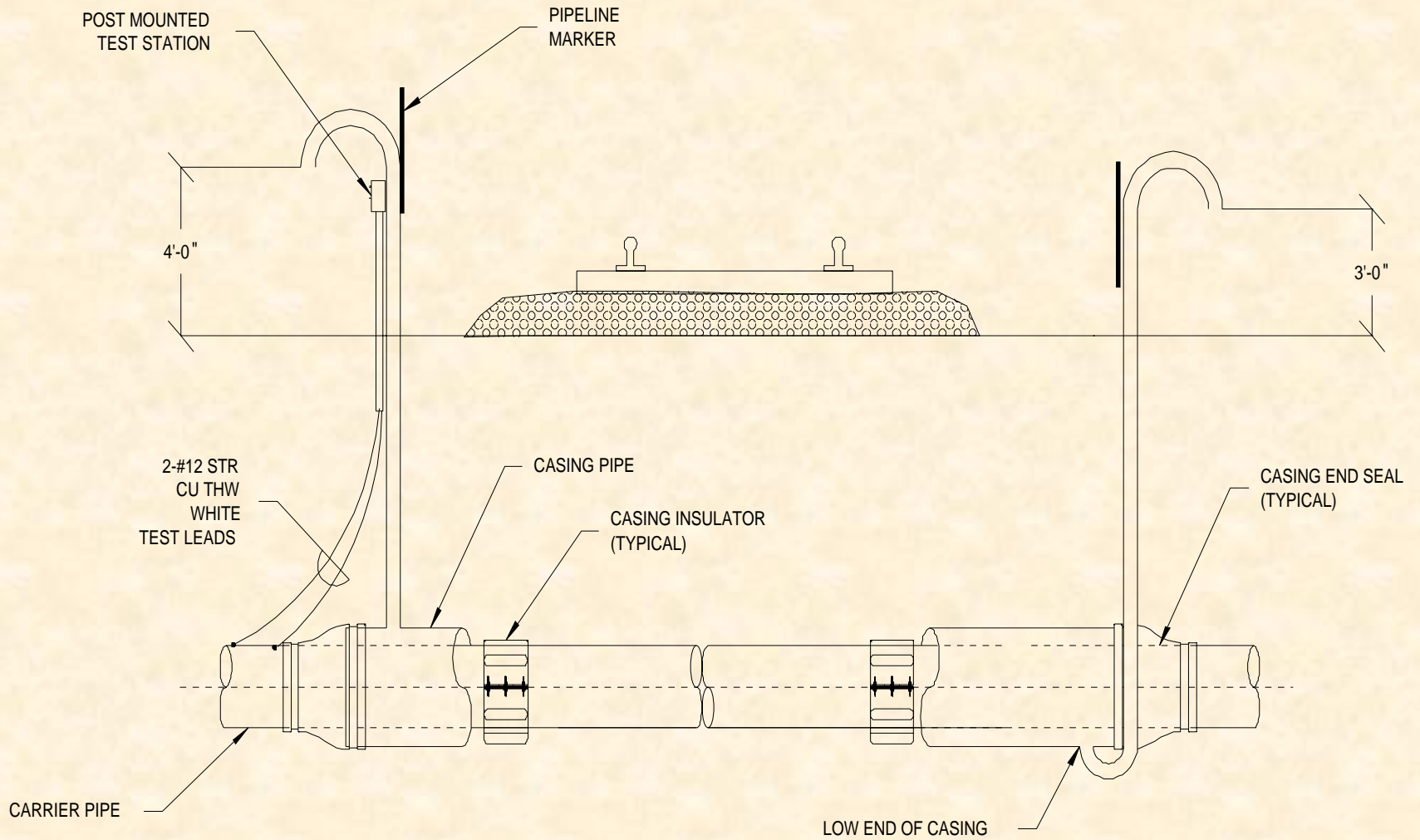
- Casing end seals keep rocks, dirt, and creepy-crawly critters out of casings, not water
- Moderately corrosive low resistivity soils
- Free Corrosion Potentials:
 - 550 Bare Casing Pipe
 - 450 Well Coated Pipeline*

* Typically well coated pipelines exhibit lower P/S potentials than bare pipelines in the same soil conditions

- 2 ma/ft² required to polarize to -850 on (from -450) or 200 mv/ma polarization
- Linear polarization characteristics over a reasonable P/S potential range
- Ignore IR drops in water in the annular space

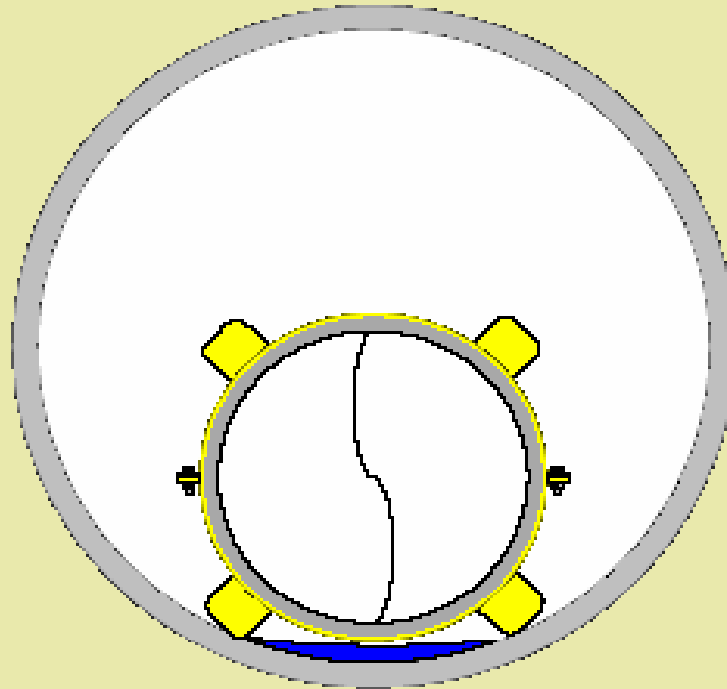
Therefore we may assume the following polarized P/S potentials, based upon assumed current densities per square foot of bare surface area.

C.P. Current Density (ma/ft²)	Coated pipeline or casing (V)	Base casing (V)
Free Corrosion Potential	-0.450	-0.550
1	-0.650	-0.750
2	-0.850	-0.950
3	-1.050	-1.150
4	-1.250	-1.350
5	-1.450	-1.550
6	-1.650	-1.750
7	-1.850	-1.950
8	-2.050	-2.150



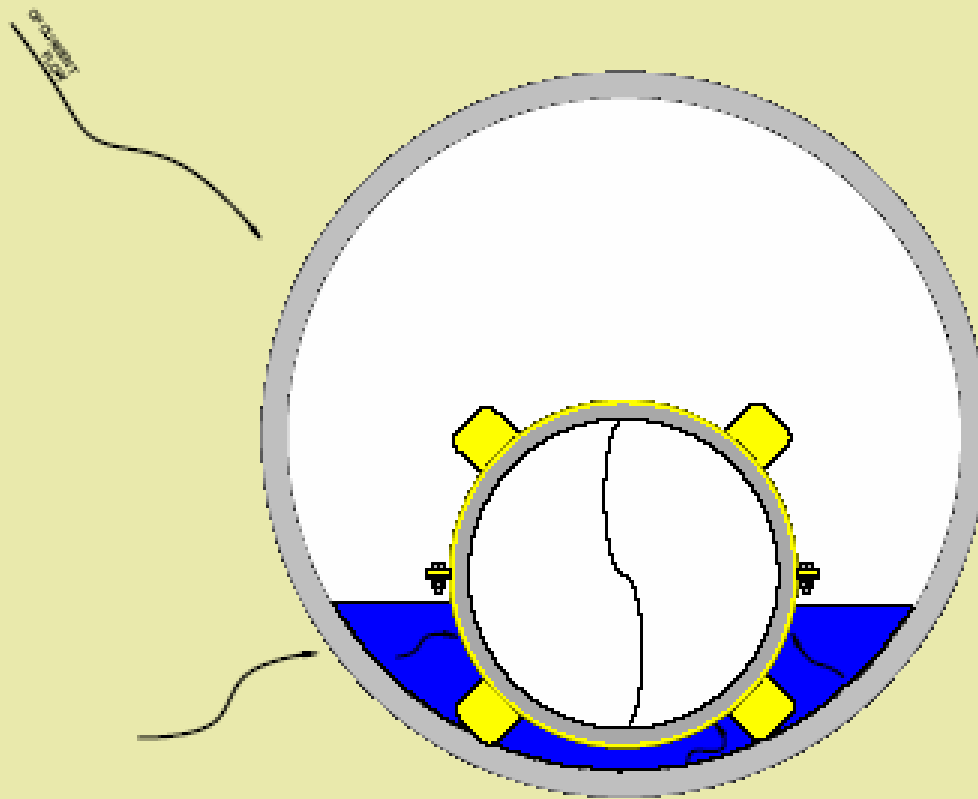
NOTES :

1. TEST STATION REQUIRED AT ONE END OF CASING ONLY. INSTALL AT MOST CONVENIENT OR PROTECTED SITE.



Dry or water below the carrier pipe

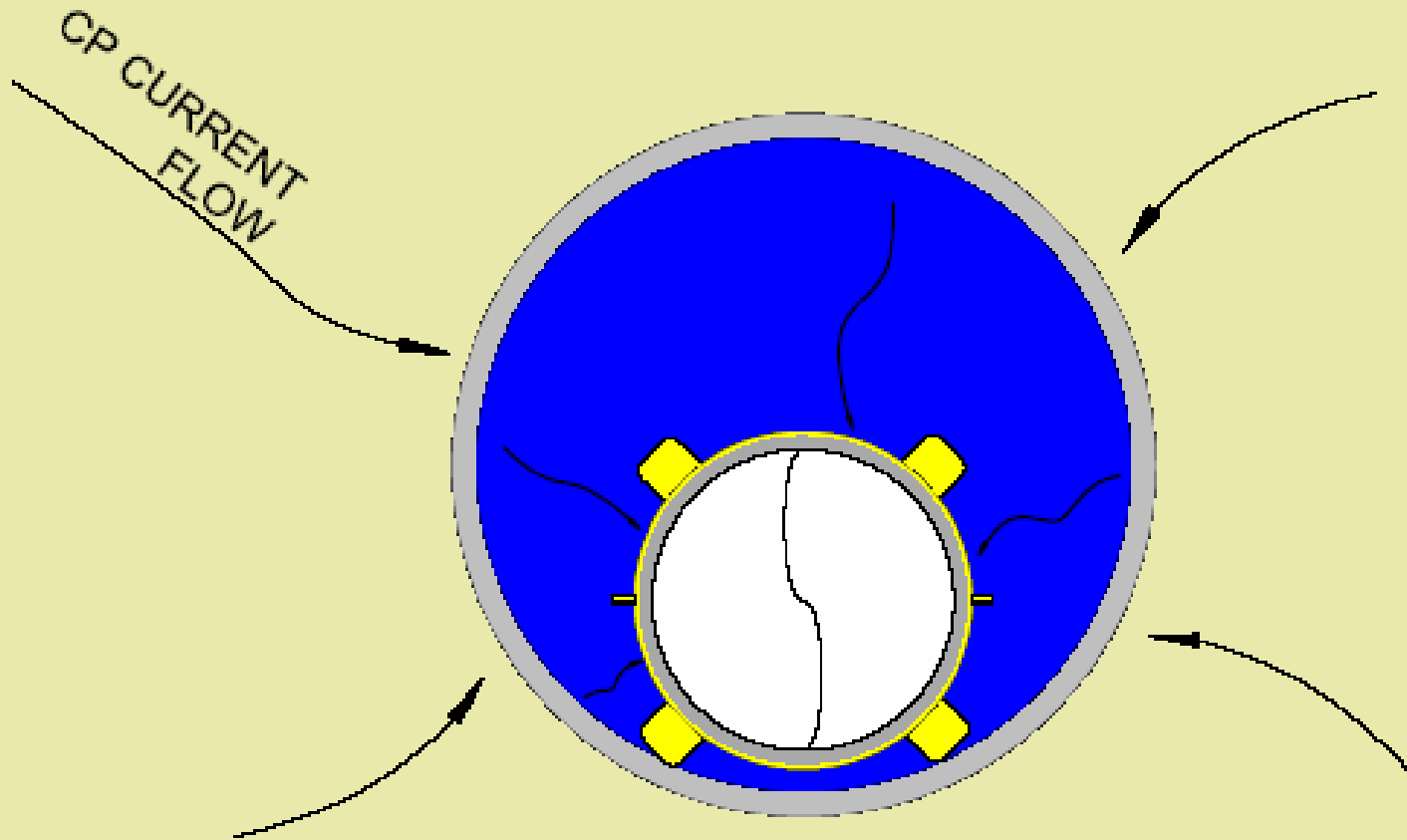
No pipeline CP current demand inside of the casing



Annulus partially full of water

Holidays on bottom of pipe submerged

Minimal CP current demand



Annulus flooded

All holidays in contact with the electrolyte

Maximum CP current demand

SCENARIO I PIPE 2% Bare Bare Casing

Pipe Condition	Surface Area (ft ²)	Resulting Polarized P/S Potentials		
		With 2 ma/ft ² At Holidays	With 4 ma/ft ² At Holidays	With 6 ma/ft ² At Holidays
100 ft 12" Pipe	333.8			
2% Holidays Pipe half submerged Equiv. Area	3.338	-0.850 At 6.676 ma	-1.250 At 13.352 ma	-1.650 At 20.028 ma
2% Holidays Pipe Submerged Equiv. Area	6.672			
100 ft 16' Casing	418.9			
Casing potential Pipe half submerged	418.9	-0.5516	-0.5532	-0.5548
Casing Potential Pipe submerged	418.9			

SCENARIO I PIPE 2% Bare Bare Casing

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2% Holidays Pipe Submerged Equiv. Area	6.672	-0.850 At 13.352 ma	-1.250 At 26.704 ma	-1.650 At 40.056 ma
100 ft 16' Casing	418.9			
Casing potential Pipe half submerged	418.9	-0.5516	-0.5532	-0.5548
Casing Potential Pipe submerged	418.9	-0.5532	-0.5564	-0.5596

SCENARIO II PIPE 2% Bare Coated Casing 50% Bare

Pipe Condition	Surface Area (ft ²)	Resulting Polarized P/S Potentials		
		With 2 ma/ft ² At Holidays	With 4 ma/ft ² At Holidays	With 6 ma/ft ² At Holidays
100 ft 12" Pipe	333.8			
2% Holidays Pipe half submerged Equiv. Area	3.338	-0.850 At 6.676 ma	-1.250 At 13.352 ma	-1.650 At 20.028 ma
2% Holidays Pipe Submerged Equiv. Area	6.672			
100 ft 16' Casing	418.9			
Casing potential Pipe half submerged	209.45	-0.5532	-0.5564	-0.5596
Casing Potential Pipe submerged	209.45			

SCENARIO II PIPE 2% Bare Coated Casing 50% Bare

Pipe Condition	Surface Area (ft ²)	Resulting Polarized P/S Potentials		
		With 2 ma/ft ² At Holidays	With 4 ma/ft ² At Holidays	With 6 ma/ft ² At Holidays
100 ft 12" Pipe	333.8			
2% Holidays Pipe half submerged Equiv. Area	3.338	-0.850 At 6.676 ma	-1.250 At 13.352 ma	-1.650 At 20.028 ma
2% Holidays Pipe Submerged Equiv. Area	6.672	-0.850 At 13.352 ma	-1.250 At 26.704 ma	-1.650 At 40.056 ma
100 ft 16' Casing	418.9			
Casing potential Pipe half submerged	209.45	-0.5532	-0.5564	-0.5596
Casing Potential Pipe submerged	209.45	-0.5564	-0.5628	-0.5691

SCENARIO III PIPE 2% Bare Coated Casing 2% Bare

Pipe Condition	Surface Area (ft ²)	Resulting Polarized P/S Potentials		
		With 2 ma/ft ² At Holidays	With 4 ma/ft ² At Holidays	With 6 ma/ft ² At Holidays
100 ft 12" Pipe	333.8			
2% Holidays Pipe half submerged Equiv. Area	3.338	-0.850 At 6.676 ma	-1.250 At 13.352 ma	-1.650 At 20.028 ma
2% Holidays Pipe Submerged Equiv. Area	6.672			
100 ft 16' Casing	418.9			
Casing potential Pipe half submerged	8.378	-0.5297	-0.6094	-0.6891
Casing Potential Pipe submerged	8.378			

SCENARIO III PIPE 2% Bare Coated Casing 2% Bare

Pipe Condition	Surface Area (ft ²)	Resulting Polarized P/S Potentials		
		With 2 ma/ft ² At Holidays	With 4 ma/ft ² At Holidays	With 6 ma/ft ² At Holidays
100 ft 12" Pipe	333.8			
2% Holidays Pipe half submerged Equiv. Area	3.338	-0.850 At 6.676 ma	-1.250 At 13.352 ma	-1.650 At 20.028 ma
2% Holidays Pipe Submerged Equiv. Area	6.672	-0.850 At 13.352 ma	-1.250 At 26.704 ma	-1.650 At 40.056 ma
100 ft 16' Casing	418.9			
Casing potential Pipe half submerged	8.378	-0.5297	-0.6094	-0.6891
Casing Potential Pipe submerged	8.378	-0.6094	-0.7687	-0.928

SCENARIO IV PIPE 2% Bare Coated Casing 1% Bare

Pipe Condition	Surface Area (ft ²)	Resulting Polarized P/S Potentials		
		With 2 ma/ft ² At Holidays	With 4 ma/ft ² At Holidays	With 6 ma/ft ² At Holidays
100 ft 12" Pipe	333.8			
2% Holidays Pipe half submerged Equiv. Area	3.338	-0.850 At 6.676 ma	-1.250 At 13.352 ma	-1.650 At 20.028 ma
2% Holidays Pipe Submerged Equiv. Area	6.672			
100 ft 16' Casing	418.9			
Casing potential Pipe half submerged	4.189	-0.6094	-0.7687	-0.9281
Casing Potential Pipe submerged	4.189			

SCENARIO IV PIPE 2% Bare Coated Casing 1% Bare

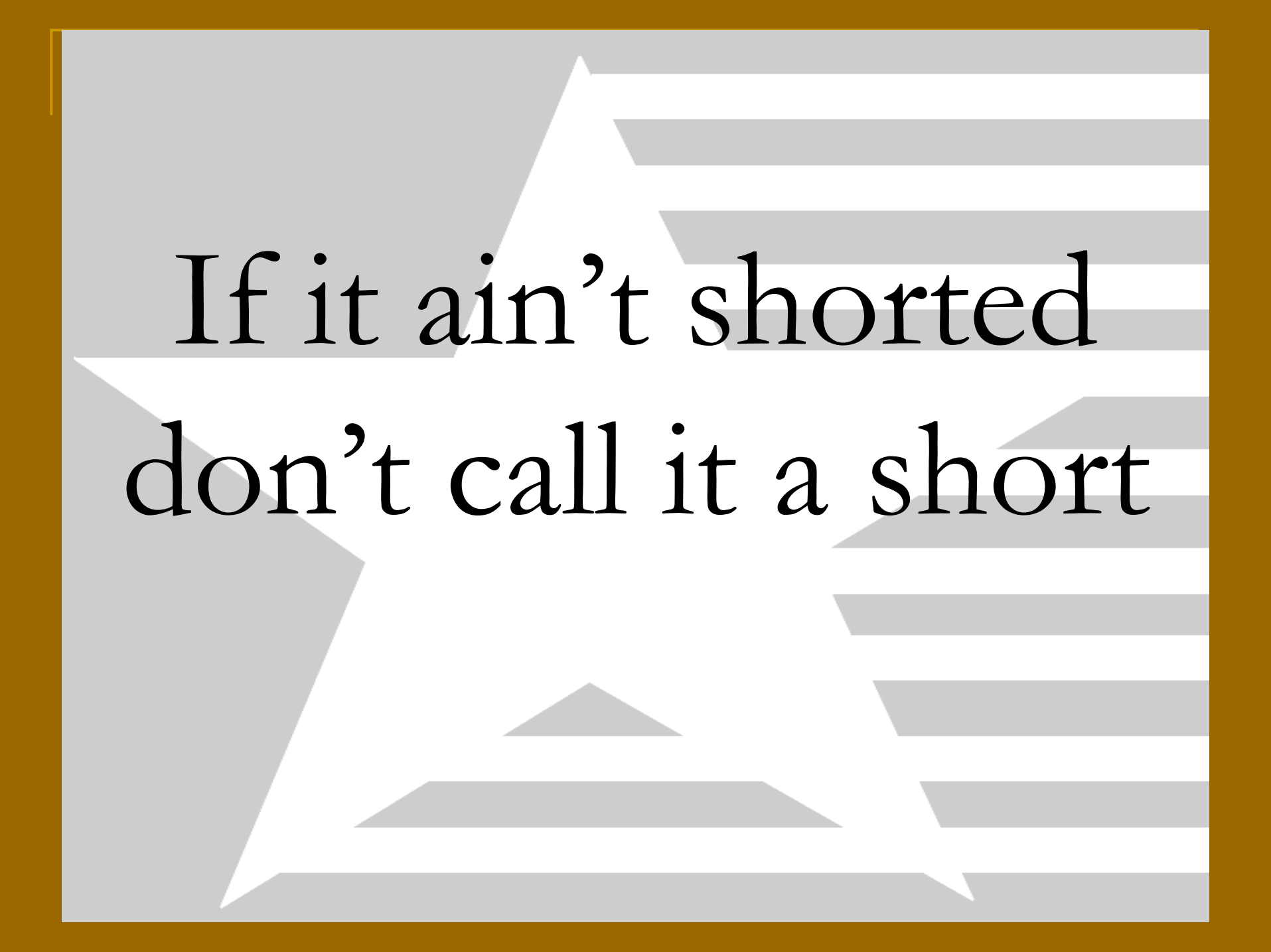
Pipe Condition	Surface Area (ft ²)	Resulting Polarized P/S Potentials		
		With 2 ma/ft ² At Holidays	With 4 ma/ft ² At Holidays	With 6 ma/ft ² At Holidays
100 ft 12" Pipe	333.8			
2% Holidays Pipe half submerged Equiv. Area	3.338	-0.850 At 6.676 ma	-1.250 At 13.352 ma	-1.650 At 20.028 ma
2% Holidays Pipe Submerged Equiv. Area	6.672	-0.850 At 13.352 ma	-1.250 At 26.704 ma	-1.650 At 40.056 ma
100 ft 16' Casing	418.9			
Casing potential Pipe half submerged	4.189	-0.6094	-0.7687	-0.9281
Casing Potential Pipe submerged	4.189	-0.7687	-1.087	-1.406

SCENARIO V Coated Pipe 5% Bare Coated Casing 2% Bare

Pipe Condition	Surface Area (ft ²)	Resulting Polarized P/S Potentials		
		With 2 ma/ft ² At Holidays	With 4 ma/ft ² At Holidays	With 6 ma/ft ² At Holidays
100 ft 12" Pipe	333.8			
5% Holidays Pipe half submerged Equiv. Area	9.345	-0.850 At 16.69 ma	-1.250 At 33.38 ma	-1.650 At 50.07 ma
5% Holidays Pipe Submerged Equiv. Area	16.69			
100 ft 16' Casing	418.9			
Casing potential Pipe half submerged	4.189	-0.8484	-1.247	-1.645
Casing Potential Pipe submerged	4.189			

SCENARIO V Coated Pipe 5% Bare Coated Casing 2% Bare

Pipe Condition	Surface Area (ft ²)	Resulting Polarized P/S Potentials		
		With 2 ma/ft ² At Holidays	With 4 ma/ft ² At Holidays	With 6 ma/ft ² At Holidays
100 ft 12" Pipe	333.8			
5% Holidays Pipe half submerged Equiv. Area	9.345	-0.850 At 16.69 ma	-1.250 At 33.38 ma	-1.650 At 50.07 ma
5% Holidays Pipe Submerged Equiv. Area	16.69	-0.850 At 33.38 ma	-1.250 At 66.76 ma	-1.650 At 100.14 ma
100 ft 16' Casing	418.9			
Casing potential Pipe half submerged	4.189	-0.8484	-1.247	-1.645
Casing Potential Pipe submerged	4.189	-1.249	-2.048	-2.847



If it ain't shorted
don't call it a short